



**THE DATASHEET OF
BA036LBSG2-TR**



Super-mini package regulator IC

BA000LBSG series

The BA000LBSG (the "000" indicates the output voltage value) is a low-saturation series regulator IC employing the super-mini mold package of the SMP5 (2916 package). Equipped with a power-saving function that reduces current consumption, it also offers outstanding ripple rejection and characteristics, and is ideal for cellular telephones and other.

●Applications

Residential / industrial device power supplies for cellular telephone such as the CDMA and GSM, and for other portable.

●Features

- 1) Internal output transistor ($I_o=150\text{mA}$)
- 2) Internal temperature protection circuit
- 3) Power-saving function enables designs with low current consumption
- 4) High level of ripple rejection (R.R.=66dB)
- 5) SMP5 super-mini package enables space-saving designs
- 6) Low I / O voltage differential (90mV Typ. at $I_o=50\text{mA}$)

●Super-mini regulator lineup

| Series | Output voltage (V) | | | | | | | | |
|-----------|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|
| | 2.8 | 2.9 | 3.0 | 3.2 | 3.3 | 3.6 | 3.8 | 4.0 | 5.0 |
| BA000LBSG | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

* "000" indicates the output voltage value. (Example : For 2.8V output, BA028LBSG)

●Absolute maximum ratings ($T_a=25^\circ\text{C}$)

| Parameter | Symbol | Limits | Unit |
|-----------------------|--------|----------|------|
| Applied voltage | Vcc | 9 | V |
| Power dissipation | Pd | 170* | mW |
| Operating temperature | Topr | -40~+85 | °C |
| Storage temperature | Tstg | -55~+125 | °C |

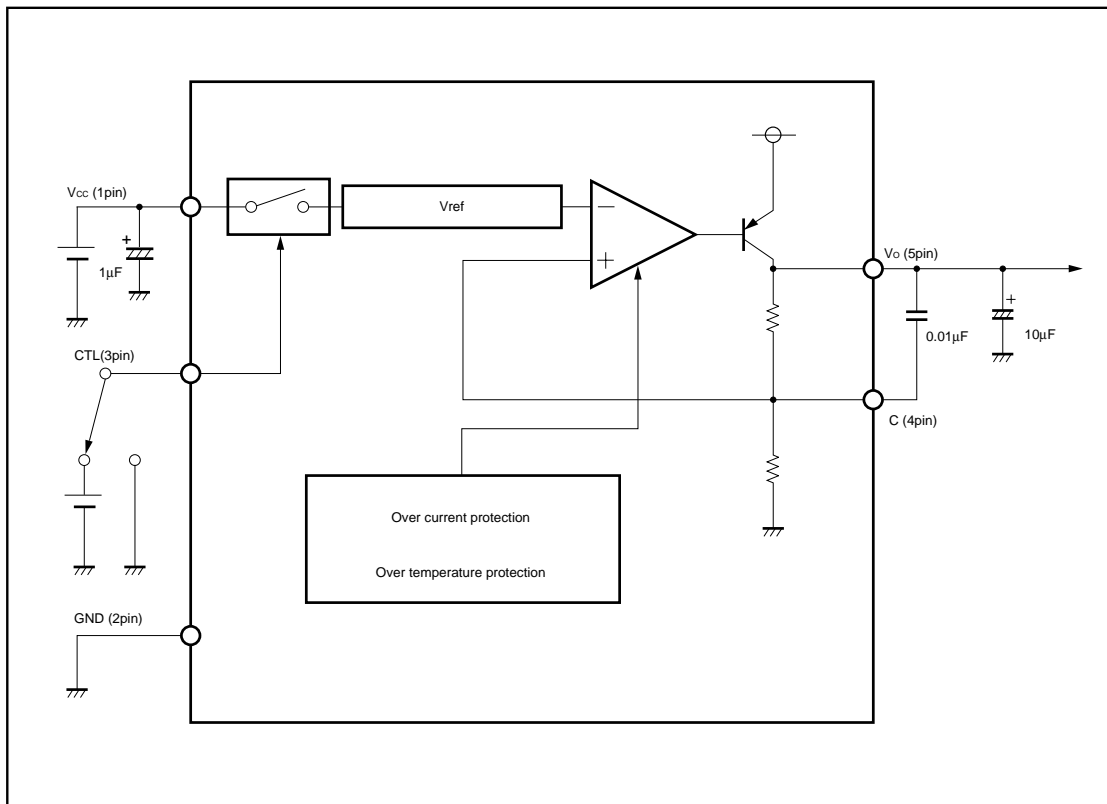
* Reduced by 1.7mW for each increase in T_a of 1°C over 25°C

●Recommended operating conditions ($T_a=25^\circ\text{C}$)

| Parameter | Symbol | Limits | Unit |
|--------------------------------|-------------|---------|------|
| Operating power supply voltage | Vcc (input) | 2.5~7.0 | V |

Regulator IC

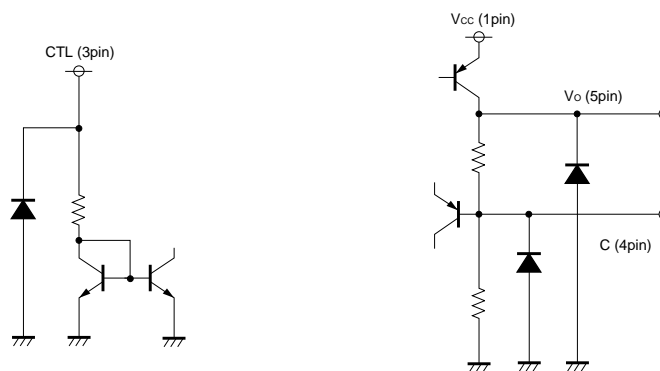
●Block diagram



●Pin descriptions

| Pin No. | Pin name | Function |
|---------|----------|---------------------|
| 1 | Vcc | Power supply |
| 2 | GND | Ground |
| 3 | CTL | Power-save function |
| 4 | C | Ripple improvement |
| 5 | OUT | Output |

●Input / output circuits



Regulator IC

●Electrical characteristics

BA028LBSG (unless otherwise noted, Ta=25°C, Vcc=3.8V)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Coniditions |
|---------------------------|------------------|------|------|------|------|---|
| Standby current | I _{ccs} | - | 0 | 10 | μA | V _{ctl} =0V |
| Circuit current | I _{cca} | - | 65 | 150 | μA | V _{ctl} =3V, no output load |
| <Output block> | | | | | | |
| Output voltage | V _o | 2.73 | 2.80 | 2.87 | V | I _o =50mA* ¹ |
| Dropout voltage | ΔV _d | - | 90 | 150 | mV | I _o =50mA, V _{cc} =0.95V _o |
| Output current capability | I _o | 150 | 280 | - | mA | - |
| Load regulation | Reg.L | - | 40 | 80 | mV | I _o =1~50mA* ¹ |
| Input regulation | Reg.I | - | 3 | 30 | mV | I _o =10mA, V _{cc} =3.8~7V* ¹ |
| Output noise voltage | e _n | - | 56 | - | μV | I _o =10mA, C=0.01μF* ² |
| Ripple rejection 1 | R.R1 | 50 | 58 | - | dB | I _o =10mA, f=400Hz |
| Ripple rejection 2 | R.R2 | - | 66 | - | dB | I _o =10mA, f=400Hz, C=0.01μF* ² |
| <Power-save block> | | | | | | |
| CTL OFF voltage | V _{off} | - | - | 0.6 | V | - |
| CTL ON voltage | V _{on} | 2.4 | - | - | V | - |
| CTL inflow current | I _{ctl} | - | 6.0 | 15 | μA | V _{ctl} =3V |

* In order to measure at Ta=Tj (pulse measurement), fluctuations in output resulting from temperature fluctuations are not included.

* Design guaranteed. (Not all products have been inspected.)

A capacitor (0.01μF) is used between pin 4 and pin 5, to improve ripple rejection.

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BA029LBSG (unless otherwise noted, Ta=25°C, Vcc=3.9V)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Coniditions |
|---------------------------|------------------|-------|------|-------|------|---|
| Standby current | I _{ccs} | - | 0 | 10 | μA | V _{ctl} =0V |
| Circuit current | I _{cca} | - | 65 | 150 | μA | V _{ctl} =3V, no output load |
| <Output block> | | | | | | |
| Output voltage | V _o | 2.828 | 2.90 | 2.973 | V | I _o =50mA* ¹ |
| Dropout voltage | ΔV _d | - | 90 | 150 | mV | I _o =50mA, V _{cc} =0.95V _o |
| Output current capability | I _o | 150 | 280 | - | mA | - |
| Load regulation | Reg.L | - | 40 | 80 | mV | I _o =1~50mA* ¹ |
| Input regulation | Reg.I | - | 3 | 30 | mV | V _{cc} =3.9~7V |
| Output noise voltage | e _n | - | 56 | - | μV | I _o =10mA, C=0.01μF* ² |
| Ripple rejection 1 | R.R1 | 45 | 58 | - | dB | I _o =10mA, f=400Hz |
| Ripple rejection 2 | R.R2 | - | 66 | - | dB | I _o =10mA, f=400Hz, C=0.01μF* ² |
| <Power-save block> | | | | | | |
| CTL OFF voltage | V _{off} | - | - | 0.6 | V | - |
| CTL ON voltage | V _{on} | 2.4 | - | - | V | - |
| CTL inflow current | I _{ctl} | - | 6.0 | 15 | μA | V _{ctl} =3V |

* In order to measure at Ta=Tj (pulse measurement), fluctuations in output resulting from temperature fluctuations are not included.

* Design guaranteed. (Not all products have been inspected.)

A capacitor (0.01μF) is used between pin 4 and pin 5, to improve ripple rejection.

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Regulator IC

BA030LBSG (unless otherwise noted, Ta=25°C, Vcc=4.0V)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Coniditions |
|---------------------------|------------------|-------|------|-------|------|---|
| Standby current | I _{ccs} | - | 0 | 10 | μA | V _{ctl} =0V |
| Circuit current | I _{cca} | - | 65 | 150 | μA | V _{ctl} =3V, no output load |
| <Output block> | | | | | | |
| Output voltage | V _o | 2.925 | 3.00 | 3.075 | V | I _o =50mA*1 |
| Dropout voltage | ΔV _d | - | 90 | 150 | mV | I _o =50mA, V _{cc} =0.95V _o |
| Output current capability | I _o | 150 | 280 | - | mA | - |
| Load regulation | Reg.L | - | 40 | 80 | mV | I _o =1~50mA*1 |
| Input regulation | Reg.I | - | 3 | 30 | mV | I _o =10mA, V _{cc} =4.0~7V*1 |
| Output noise voltage | en | - | 56 | - | μV | I _o =10mA, C=0.01μF*2 |
| Ripple rejection 1 | R.R1 | 50 | 58 | - | dB | I _o =10mA, f=400Hz |
| Ripple rejection 2 | R.R2 | - | 66 | - | dB | I _o =10mA, f=400Hz, C=0.01μF*2 |
| <Power-save block> | | | | | | |
| CTL OFF voltage | V _{off} | - | - | 0.6 | V | - |
| CTL ON voltage | V _{on} | 2.4 | - | - | V | - |
| CTL inflow current | I _{ctl} | - | 6.0 | 15 | μA | V _{ctl} =3V |

* In order to measure at Ta=Tj (pulse measurement), fluctuations in output resulting from temperature fluctuations are not included.

* Design guaranteed. (Not all products have been inspected.)

A capacitor (0.01μF) is used between pin 4 and pin 5, to improve ripple rejection.

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BA032LBSG (unless otherwise noted, Ta=25°C, Vcc=4.2V)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Coniditions |
|---------------------------|------------------|------|------|------|------|---|
| Standby current | I _{ccs} | - | 0 | 10 | μA | V _{ctl} =0V |
| Circuit current | I _{cca} | - | 65 | 150 | μA | V _{ctl} =3V, no output load |
| <Output block> | | | | | | |
| Output voltage | V _o | 3.12 | 3.20 | 3.28 | V | I _o =50mA*1 |
| Dropout voltage | ΔV _d | - | 90 | 150 | mV | I _o =50mA, V _{cc} =0.95V _o |
| Output current capability | I _o | 150 | 280 | - | mA | - |
| Load regulation | Reg.L | - | 40 | 80 | mV | I _o =1~50mA*1 |
| Input regulation | Reg.I | - | 3 | 30 | mV | I _o =10mA, V _{cc} =4.2~7V*1 |
| Output noise voltage | en | - | 56 | - | μV | I _o =10mA, C=0.01μF*2 |
| Ripple rejection 1 | R.R1 | 50 | 58 | - | dB | I _o =10mA, f=400Hz |
| Ripple rejection 2 | R.R2 | - | 66 | - | dB | I _o =10mA, f=400Hz, C=0.01μF*2 |
| <Power-save block> | | | | | | |
| CTL OFF voltage | V _{off} | - | - | 0.6 | V | - |
| CTL ON voltage | V _{on} | 2.4 | - | - | V | - |
| CTL inflow current | I _{ctl} | - | 6.0 | 15 | μA | V _{ctl} =3V |

* In order to measure at Ta=Tj (pulse measurement), fluctuations in output resulting from temperature fluctuations are not included.

* Design guaranteed. (Not all products have been inspected.)

A capacitor (0.01μF) is used between pin 4 and pin 5, to improve ripple rejection.

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Regulator IC

BA033LBSG (unless otherwise noted, Ta=25°C, Vcc=4.3V)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Coniditions |
|---------------------------|------------------|-------|------|-------|------|---|
| Standby current | I _{ccs} | - | 0 | 10 | μA | V _{ctl} =0V |
| Circuit current | I _{cca} | - | 65 | 150 | μA | V _{ctl} =3V, no output load |
| <Output block> | | | | | | |
| Output voltage | V _o | 3.218 | 3.30 | 3.382 | V | I _o =50mA*1 |
| Dropout voltage | ΔV _d | - | 90 | 150 | mV | I _o =50mA, V _{cc} =0.95V _o |
| Output current capability | I _o | 150 | 280 | - | mA | - |
| Load regulation | Reg.L | - | 40 | 80 | mV | I _o =1~50mA*1 |
| Input regulation | Reg.I | - | 3 | 30 | mV | V _{cc} =4.3~7V |
| Output noise voltage | en | - | 56 | - | μV | I _o =10mA, C=0.01μF*2 |
| Ripple rejection 1 | R.R1 | 45 | 58 | - | dB | I _o =10mA, f=400Hz |
| Ripple rejection 2 | R.R2 | - | 66 | - | dB | I _o =10mA, f=400Hz, C=0.01μF*2 |
| <Power-save block> | | | | | | |
| CTL OFF voltage | V _{off} | - | - | 0.6 | V | - |
| CTL ON voltage | V _{on} | 2.4 | - | - | V | - |
| CTL inflow current | I _{ctl} | - | 6.0 | 15 | μA | V _{ctl} =3V |

* In order to measure at Ta=Tj (pulse measurement), fluctuations in output resulting from temperature fluctuations are not included.

* Design guaranteed. (Not all products have been inspected.)

A capacitor (0.01μF) is used between pin 4 and pin 5, to improve ripple rejection.

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BA036LBSG (unless otherwise noted, Ta=25°C, Vcc=4.6V)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Coniditions |
|---------------------------|------------------|------|------|------|------|---|
| Standby current | I _{ccs} | - | 0 | 10 | μA | V _{ctl} =0V |
| Circuit current | I _{cca} | - | 65 | 150 | μA | V _{ctl} =3V, no output load |
| <Output block> | | | | | | |
| Output voltage | V _o | 3.51 | 3.60 | 3.69 | V | I _o =50mA*1 |
| Dropout voltage | ΔV _d | - | 90 | 150 | mV | I _o =50mA, V _{cc} =0.95V _o |
| Output current capability | I _o | 150 | 280 | - | mA | - |
| Load regulation | Reg.L | - | 40 | 80 | mV | I _o =1~50mA*1 |
| Input regulation | Reg.I | - | 3 | 30 | mV | V _{cc} =4.6~7V |
| Output noise voltage | en | - | 56 | - | μV | I _o =10mA, C=0.01μF*2 |
| Ripple rejection 1 | R.R1 | 45 | 56 | - | dB | I _o =10mA, f=400Hz |
| Ripple rejection 2 | R.R2 | - | 66 | - | dB | I _o =10mA, f=400Hz, C=0.01μF*2 |
| <Power-save block> | | | | | | |
| CTL OFF voltage | V _{off} | - | - | 0.6 | V | - |
| CTL ON voltage | V _{on} | 2.4 | - | - | V | - |
| CTL inflow current | I _{ctl} | - | 6.0 | 15 | μA | V _{ctl} =3V |

* In order to measure at Ta=Tj (pulse measurement), fluctuations in output resulting from temperature fluctuations are not included.

* Design guaranteed. (Not all products have been inspected.)

A capacitor (0.01μF) is used between pin 4 and pin 5, to improve ripple rejection.

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Regulator IC

BA038LBSG (unless otherwise noted, Ta=25°C, Vcc=4.8V)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Coniditions |
|---------------------------|------------------|-------|------|-------|------|---|
| Standby current | I _{ccs} | - | 0 | 10 | μA | V _{ctl} =0V |
| Circuit current | I _{cca} | - | 65 | 150 | μA | V _{ctl} =3V, no output load |
| <Output block> | | | | | | |
| Output voltage | V _o | 3.705 | 3.80 | 3.895 | V | I _o =50mA* ¹ |
| Dropout voltage | ΔV _d | - | 90 | 150 | mV | I _o =50mA, V _{cc} =0.95V _o |
| Output current capability | I _o | 150 | 280 | - | mA | - |
| Load regulation | Reg.L | - | 40 | 80 | mV | I _o =1~50mA* ¹ |
| Input regulation | Reg.I | - | 3 | 30 | mV | I _o =10mA, V _{cc} =4.8~7V* ¹ |
| Output noise voltage | en | - | 56 | - | μV | I _o =10mA, C=0.01μF* ² |
| Ripple rejection 1 | R.R1 | 50 | 56 | - | dB | I _o =10mA, f=400Hz |
| Ripple rejection 2 | R.R2 | - | 66 | - | dB | I _o =10mA, f=400Hz, C=0.01μF* ² |
| <Power-save block> | | | | | | |
| CTL OFF voltage | V _{off} | - | - | 0.6 | V | - |
| CTL ON voltage | V _{on} | 2.4 | - | - | V | - |
| CTL inflow current | I _{ctl} | - | 6.0 | 15 | μA | V _{ctl} =3V |

* In order to measure at Ta=Tj (pulse measurement), fluctuations in output resulting from temperature fluctuations are not included.

* Design guaranteed. (Not all products have been inspected.)

A capacitor (0.01μF) is used between pin 4 and pin 5, to improve ripple rejection.

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BA040LBSG (unless otherwise noted, Ta=25°C, Vcc=5.0V)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Coniditions |
|---------------------------|------------------|------|------|------|------|---|
| Standby current | I _{ccs} | - | 0 | 10 | μA | V _{ctl} =0V |
| Circuit current | I _{cca} | - | 65 | 150 | μA | V _{ctl} =3V, no output load |
| <Output block> | | | | | | |
| Output voltage | V _o | 3.90 | 4.00 | 4.10 | V | I _o =50mA* ¹ |
| Dropout voltage | ΔV _d | - | 90 | 150 | mV | I _o =50mA, V _{cc} =0.95V _o |
| Output current capability | I _o | 150 | 280 | - | mA | - |
| Load regulation | Reg.L | - | 40 | 80 | mV | I _o =1~50mA* ¹ |
| Input regulation | Reg.I | - | 3 | 30 | mV | V _{cc} =5.0~7V |
| Output noise voltage | en | - | 56 | - | μV | I _o =10mA, C=0.01μF* ² |
| Ripple rejection 1 | R.R1 | 45 | 56 | - | dB | I _o =10mA, f=400Hz |
| Ripple rejection 2 | R.R2 | - | 66 | - | dB | I _o =10mA, f=400Hz, C=0.01μF* ² |
| <Power-save block> | | | | | | |
| CTL OFF voltage | V _{off} | - | - | 0.6 | V | - |
| CTL ON voltage | V _{on} | 2.4 | - | - | V | - |
| CTL inflow current | I _{ctl} | - | 6.0 | 15 | μA | V _{ctl} =3V |

* In order to measure at Ta=Tj (pulse measurement), fluctuations in output resulting from temperature fluctuations are not included.

* Design guaranteed. (Not all products have been inspected.)

A capacitor (0.01μF) is used between pin 4 and pin 5, to improve ripple rejection.

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Regulator IC

BA050LBSG (unless otherwise noted, Ta=25°C, Vcc=6.0V)

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Coniditions |
|---------------------------|------------------|-------|------|-------|------|---|
| Standby current | I _{ccs} | - | 0 | 10 | μA | V _{ctl} =0V |
| Circuit current | I _{cca} | - | 65 | 150 | μA | V _{ctl} =3V, no output load |
| <Output block> | | | | | | |
| Output voltage | V _o | 4.875 | 5.00 | 5.125 | V | I _o =50mA*1 |
| Dropout voltage | ΔV _d | - | 90 | 150 | mV | I _o =50mA, V _{cc} =0.95V _o |
| Output current capability | I _o | 150 | 280 | - | mA | - |
| Load regulation | Reg.L | - | 40 | 80 | mV | I _o =1~50mA*1 |
| Input regulation | Reg.I | - | 3 | 30 | mV | V _{cc} =6.0~7V |
| Output noise voltage | e _n | - | 56 | - | μV | I _o =10mA, C=0.01μF*2 |
| Ripple rejection 1 | R.R1 | 45 | 54 | - | dB | I _o =10mA, f=400Hz |
| Ripple rejection 2 | R.R2 | - | 66 | - | dB | I _o =10mA, f=400Hz, C=0.01μF*2 |
| <Power-save block> | | | | | | |
| CTL OFF voltage | V _{off} | - | - | 0.6 | V | - |
| CTL ON voltage | V _{on} | 2.4 | - | - | V | - |
| CTL inflow current | I _{ctl} | - | 6.0 | 15 | μA | V _{ctl} =3V |

* In order to measure at Ta≒Tj (pulse measurement), fluctuations in output resulting from temperature fluctuations are not included.

* Design guaranteed. (Not all products have been inspected.)

A capacitor (0.01μF) is used between pin 4 and pin 5, to improve ripple rejection.

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●Application example

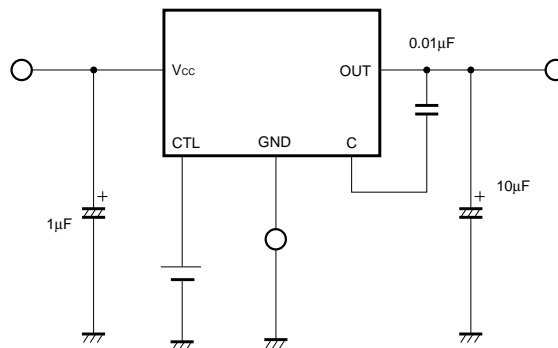
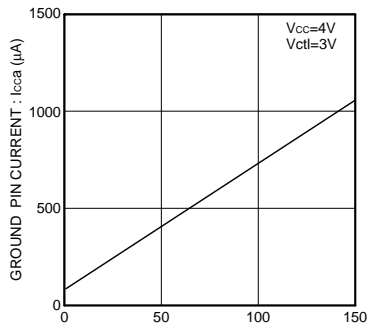


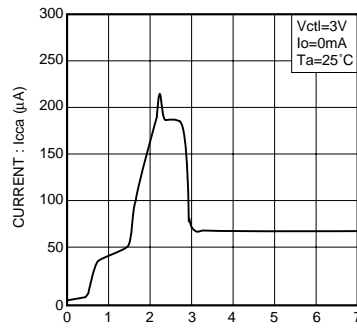
Fig.1

Regulator IC

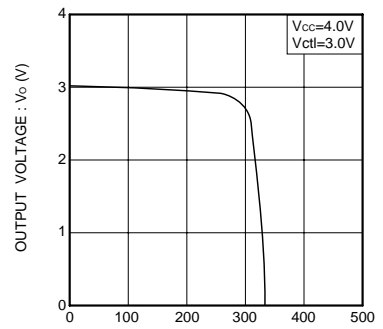
●Electrical characteristic curves (BA030LBSG)



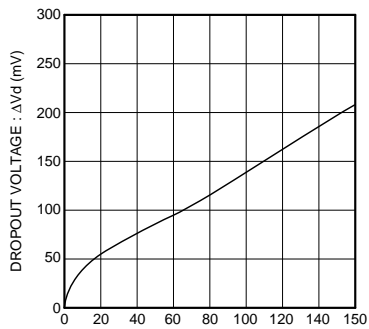
LOAD CURRENT : I_o (mA)
Fig.2 I_{cca} vs. I_o



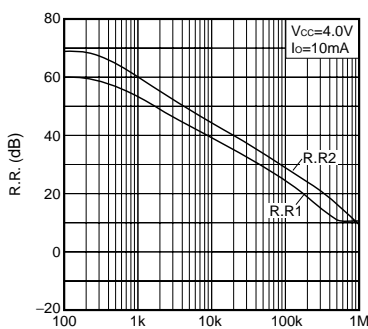
SUPPLY VOLTAGE : V_{cc} (V)
Fig.3 I_{cca} vs. V_{cc}



LOAD CURRENT : I_o (mA)
Fig.4 I_o vs. V_o

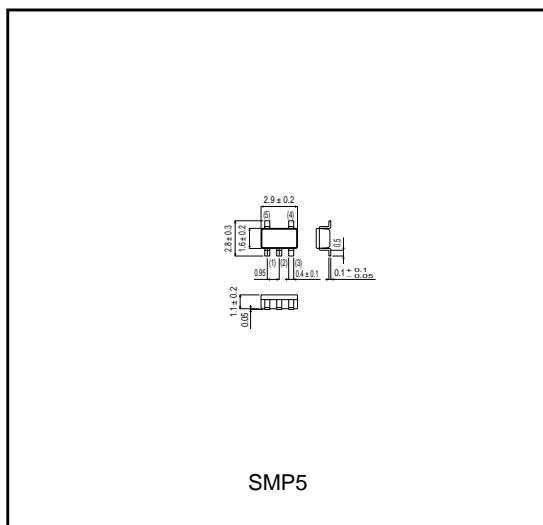


OUTPUT CURRENT : I_o (mA)
Fig.5 ΔV_d vs. I_o



FREQUENCY : f (Hz)
Fig.6 R.R. vs. f characteristics

●External dimensions (Units : mm)



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